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an independent steam-valve for the high-pressure cylinder, shown at *a*, is added, so as to avoid damaging the action of the low-pressure valve and the high-pressure exhaust.

As an example of this practice, in an engine of 275 horse-power of this type, now being constructed for a United States steam-tender, a piston-valve is used for the steam-valve of the high-pressure cylinder, and a slide-valve for admitting the steam into the low-pressure cylinder and exhausting it therefrom. For small engines an ordinary governor, not shown in the cuts, is usually attached.

The special advantages claimed for this engine are compactness, a low centre of gravity, and particularly the fact that all the moving parts are in pairs, equal, and acting in opposite directions, thus securing a perfect mechanical balance, and adapting the engine to high rates of speed without sensible vibration.

As evidence of the adaptability of this engine for electric-lighting purposes, it may be stated that it has been attached to a thousand-light dynamo, which it ran at the rate of seven hundred and fifty revolutions per minute; and so steady was its performance, and so well was it governed, that, when the entire load was thrown off by means of a switch, it made no perceptible change in its running. The throwing on and off of such a load is a very severe test for an engine.

The following extract is taken from the report of a board of government engineers who had examined this engine with a view to determining its adaptability for the various uses of the government: "The engines are compact, and the working parts are reduced to a minimum; and they have the advantage of long connecting rods, and a reduction of height over the ordinary vertical engine with the same length of connecting rod. They are also well-balanced engines."

THE WITHDRAWAL OF ALCOHOL FROM BOND FOR SCIENTIFIC PURPOSES, FREE OF TAX.¹

It may not be generally known to the members of this association that they can obtain their supplies of alcohol for use in their chemical laboratories free of the internal revenue tax of ninety cents per proof gallon, or \$1.70 per gallon of ninety-five per cent alcohol, by complying with certain regulations prescribed by the secretary of the treasury, in accordance with section 3297 of the Revised Statutes of the United States.

The Law.

This section provides that "the secretary of the treasury is authorized to grant permits to any incorporated or chartered scientific institution or college of learning to withdraw alcohol in specified quantities from bond without payment of the internal revenue tax on the same, or on the spirits from which the alcohol has been distilled, for the sole purpose of preserving specimens of anatomy, physiology, or natural history belonging to such institution, or for use in its chemical laboratory; *provided*, that applications for permits shall be made by the president or curator of such institution, who shall file a bond for double the amount of the tax on the alcohol to be withdrawn, with two good and sufficient sureties, to be approved by the commissioner of internal revenue, and conditioned that the whole quantity of alcohol so withdrawn from bond shall be used for the purposes above specified, and for no other, and that the said president or curator shall comply with such other requirements and regulations as the secretary of the treasury may prescribe. And if any alcohol so obtained is used by any officer, as aforesaid, of such institution, for any purposes other than those above specified, then the said officer or sureties shall pay the tax on the whole amount of alcohol withdrawn from bond, together with a like amount as a penalty in addition thereto."

The above provisions are further extended by the act, approved May 3, 1878 (20 U. S. Stat. 48), which provides:—

"That the secretary of the treasury is authorized to grant permits, as provided for in section thirty-two hundred and ninety-seven of the Revised Statutes of the United States passed at the

first session of the Forty-third Congress, to any scientific university, or college of learning created or constituted such by any State or Territory under its laws, though not incorporated or chartered, upon the same terms and subject to the same restrictions and penalties, already provided by said section thirty-two hundred and ninety-seven: *provided further*, that the bond required thereby may be executed by any officer of such university or college, or by any other person for it, and on its behalf, with two good and sufficient sureties, upon like conditions, and to be approved as by said section is provided."

Documentary Evidence required from a Scientific Institution before it can enjoy this Privilege.

To obtain this privilege for its chemical laboratory, an incorporated or chartered, or not incorporated or not chartered, scientific institution, university, or college of learning must, at the time of its original application, clearly show, by a copy of its charter, articles of incorporation, or other documentary evidence, that it is an institution duly entitled to such permit by possessing a suitably equipped chemical laboratory and otherwise.

Form of Application.

Its application is made by the president, curator, or duly authorized agent, "through the collector of internal revenue in whose district the institution for which the withdrawal is to be made is situated," "to the secretary of the treasury for permit" "to withdraw from the distillery bonded warehouse, owned by —, at —, in the — district of —, the alcohol which was stored in said warehouse on the — day of —, 18—, described as follows: viz., number of packages; marks and serial numbers of packages; numbers of warehouse-stamps; wine-gallons; degree of proof; proof-gallons; taxable gallons; and amount of tax; for the *sole purpose* of use in the chemical laboratory of the institution, located at —, in the State of —, of which institution" the signer is one of the persons above mentioned.

"The application in all cases must be sworn to, or affirmed, before an officer authorized to administer oaths."

Character of the Bond.

The bond, required to be filed with the first application, must be in a penal sum of "not less than \$200, and never less than double the amount of tax on the alcohol withdrawn at any one time," is signed by the applicant "as principal, and with two or more sureties, who shall not be officers of the institution in which the alcohol is to be used, but shall be residents of the United States judicial district in which such institution is located." In the case of "an incorporated institution, its name should be signed to the bond as principal, and its corporate seal affixed by its duly authorized officer, who should also sign his own name as such officer."

The bond is conditioned that "the entire quantity of alcohol" intended to be withdrawn "from distillery warehouse, without payment of tax," by the said principal, will be "for the sole purpose of use in the chemical laboratory of the" said institution, "in the city or town of —, of the county or parish of —, and State of —," "and for no other purpose."

The bond is known as a "continuing bond;" i.e., "withdrawals may be made from time to time," "by the said principal," "until this bond shall have been revoked or cancelled by direction of the secretary of the treasury," of certain alcohol for use "by the said institution, or the proper officer thereof, for the purpose above specified, and for no other purpose." "The principal of said institution shall, as to each lot of alcohol so withdrawn, produce within" the time "fixed by the collector accepting the bond," "from the date of such withdrawal," "proof satisfactory to" the collector of internal revenue of that district, "and to the commissioner of internal revenue, that the said alcohol has been so used for the purpose above specified, and for no other purpose." He shall also "comply with such other requirements and regulations as the secretary of the treasury may prescribe;" and according to the last paragraph of section 3297, Revised Statutes, "the said officer or sureties" are bound by this bond to pay to the collector "the tax on the whole amount of alcohol withdrawn from bond, together with a like amount as a penalty in addition thereto," "in case said

¹ Paper read before the Association of Official Agricultural Chemists at Washington, D C., Sept. 11, 1889.

alcohol, or any part thereof, shall be used for any purpose other than that specified."

Bond and Application to be filed with the Collector for Approval.

The "bond, together with the first application for permit, will be deposited by the applicant with the collector of internal revenue for the district where the institution in which the alcohol is to be used is located." It is the collector's duty to forward the bond and application to the commissioner of internal revenue, with his certificate of approval, etc. He keeps "a copy of the bond, or a memorandum of its date, penal sum, and the names of the signers; and whenever an application for alcohol is made after the first one, the collector will certify to the commissioner of internal revenue that the bond remains good, or will notify him of any change affecting the responsibility of the signers." "Upon the approval of the bond by the commissioner of internal revenue," applications may be made on the prescribed form "for the withdrawal of alcohol as occasion may require" by the duly authorized officer or agent: "*provided*, the penal sum of the bond is equal to double the amount of tax on the alcohol to be withdrawn, after deducting all outstanding charges on the bond." The commissioner transmits the applications "to the secretary of the treasury, with a notification of the approval of the bond when the first application is forwarded, and afterwards with a reference to the bond under which the application is made."

Cancellation of Bond.

To cancel the bond "or for the purpose of obtaining a credit on said bond," a sworn certificate is "required of the officer or officers of the institution under whose direction or supervision the alcohol has been used." The certificate is "filed with the collector named in the bond, and if approved, to be forwarded by him to the commissioner of internal revenue with his approval indorsed thereon."

Extension of Time named in Bond.

It sometimes happens that the alcohol is not entirely used up in the time specified in the bond, and that consequently "the principal to the bond is unable, for good cause, to furnish the required proof" of such use. He may obtain an extension of the time named in the bond upon application to the commissioner of internal revenue, "accompanied by the consent of the sureties to the bond to such extension; such application and consent to be approved by the collector with whom the bond was originally filed." "The extension asked for must be for a specified time," "not exceeding one-half the period named in the bond." The application "must be sworn to," and state "the reasons why the conditions of the bond as to the presentation of proof have not been complied with." The consent of the sureties must be "under seal, and witnessed as in the case of giving an original bond."

Permits to be issued by the Secretary of the Treasury.

"The secretary of the treasury will issue," "upon receipt of the application" "and notice of the approval of the bond," "and transmit through the commissioner of internal revenue, a permit in duplicate, one copy of which will be forwarded to the applicant and the other copy to the collector of internal revenue for the district in which the distillery warehouse is located," to withdraw from the specified warehouse the number of proof gallons of alcohol described in said application.

The collector notifies "the storekeeper at the bonded warehouse from which the spirits are to be withdrawn" of the receipt of the permit, a copy of which is sent to him, and authorizes him "to deliver the spirits to the person named therein, or his duly-authorized agent, without the payment of tax, upon delivery to such storekeeper and cancellation by him of the duplicate permit issued to such person." This "cancellation shall be made by writing across the face of said duplicate permit the words 'The spirits herein described were delivered to the person herein named this — day of —, 18—;' to be signed by the storekeeper." "There shall also be indorsed on the back of said permit the following receipt: 'Received the spirits within mentioned this — day of —, 18—,' which receipt shall be signed by the person named in said permit."

Such in detail are the steps to be followed as prescribed by the regulations of the secretary of the treasury under date of March 26, 1889.

Blank forms are not furnished by the Treasury Department; and such forms, either printed or written, must be supplied by the parties making the application and bond. The forms to be followed are contained in Circular No. 34, 1889, of March 26, 1889, Treasury Department.

Are Agricultural Experiment Stations entitled to this Privilege?

The laws, quoted above, restrict this privilege of the withdrawal of alcohol free of tax to four specified beneficiaries: viz., (1) "any scientific institution" or (2) "college of learning," "incorporated or chartered;" (3) "any scientific university" or (4) "college of learning" "created and constituted such by any State or Territory under its laws, though not incorporated or chartered;" which are further qualified as using alcohol (*a*) to preserve specimens of anatomy, (*b*) physiology, or (*c*) natural history, or (*d*) to be employed in its chemical laboratory. With the latter qualification the members of this association are chiefly concerned.

The act, approved March 2, 1887, "to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July 2, 1862, and of the acts supplementary thereto" (24 *U. S. Stat.* 440), commonly called the "Hatch bill," provides in section 8 that these "agricultural experiment stations established by law" may or may not be "in connection with any university, college, or institution not distinctly an agricultural college or school," or may or may not be "separate from" "colleges entitled" "to the benefits of this act;" i.e., land-grant agricultural colleges.

Section 2 provides "that it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on . . . the chemical composition of useful plants at their different stages of growth; . . . the analysis of soils and water; the chemical composition of manures, natural or artificial; with experiments designated to test their comparative effects on crops of different kinds; . . . the value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific . . . questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories."

These experiments evidently require a well-equipped chemical laboratory, in which alcohol would be often used as a solvent and re-agent in addition to any use of it as a fuel in the laboratory.

Taking the above quoted qualifications and provisions of law into consideration, it would seem that any agricultural experiment station that is established in conformity to the provisions of the act of March 2, 1887, by any State or Territory as such, when such station is connected with a "university or college of learning," is entitled on presentation, by its duly authorized officer or agent, of documentary evidence to that effect submitted to the secretary of the treasury through the commissioner of internal revenue and the collector of internal revenue of the district in which the experiment station is situated, and by filing a bond and otherwise conforming to the regulations, above specified, to the privilege of withdrawing alcohol, free of tax, for use in its chemical laboratory; also that when the experiment is not connected with a college, etc., it may obtain free alcohol under the same regulations, provided it is shown to the satisfaction of the internal revenue officers and the secretary of the treasury that it is of itself a "scientific institution" as construed by those officers, that is, such an institution whose object is educational.

EDGAR RICHARDS.

WHEN an electric current, says a French contemporary, is led through the leaf of a rose, the leaf loses its color, leaving a white line. This peculiarity was recently turned to account at a great dinner in Paris, when, instead of the ordinary card, the seat of each guest was indicated by his name being inscribed in white letters upon a rose-leaf in his *couvert*.